



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,972	09/22/2006	Kouji Nishikawa	296637US0PCT	5623
22850	7590	01/04/2008		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.			EXAMINER	
1940 DUKE STREET			HAMILTON, CYNTHIA	
ALEXANDRIA, VA 22314				
			ART UNIT	PAPER NUMBER
			1795	
			NOTIFICATION DATE	DELIVERY MODE
			01/04/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/593,972	NISHIKAWA ET AL.
	Examiner Cynthia Hamilton	Art Unit 1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 31 October 2007.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1 and 4-18 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1, 4-18 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_.  
 4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date \_\_\_\_\_.  
 5) Notice of Informal Patent Application  
 6) Other: \_\_\_\_\_.

## DETAILED ACTION

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10 provides for the use of the resin of claim 1 in a process for producing a plated shaped article, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 10 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

3. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 provides for the use of the resin of claim 1 in a process for producing a bump, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 11 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

4. The disclosure is objected to because of the following informalities: On page 28, line 13, the examiner believes that "tetrapheyl" should be "tetraphenyl" when considering well known photoinitiators that are bisimidazoles. If the examiner is in error, please present a reference showing the structure of

2,2'-  
bis(2,4-dichlorophenyl)-4,5,4',5'-tetrapheyl-1,2'-  
bisimidazole

in order that the objection can be removed. The examiner believes applicants are trying to reference a specie of the well known HABI class of photoinitiators as set forth by Monroe et al (Chem. Rev.) starting on page 440 at D. Hexaarylbisimidazoles. The examiner believes any worker well versed in the free radical photoinitiator art would see that this was a clear issue of misspelling. Appropriate correction is required.

5. Claim 1 is objected to because of the following informalities: See "tetrapheyl" and above rejection to the Specification. Appropriate correction is required.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 4-8, 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al (4,990,428). With respect to instant claims 1, 4-8, 12 and 18, the composition of Example 6 of Shimizu et al teaches all of a species of the instant invention with the exception of the photoinitiator used the intended use and the percentages of some of the components used. The copolymer of hydroxyphenylmethacrylamide are the polymers of instant formula (2) wherein n=0 and m=0 and R1=Hydrogen atom and R2 is a single bond as there are no methylene groups present because n=0. Thus, when Shimizu teaches the combining of the polymer in claim 1 with the addition polymerizable unsaturated compound and photopolymerization initiator, the polymer of Example 6 is an example of the polymer as is trimethylolpropane triacrylate found in col. 9, line 14, is an example of the addition polymerizable unsaturated compound. While example 6 makes use of triazine, and a napthothiazoline as the photoinitiator system in Example 6, Shimizu et al teach in col. 6, lines 34-43, the use of any conventional photopolymerization initiators in their compositions. One given is biimidazole of which an example is found in Example 8 of Shimizu et al which is the same as the compound given in claim 1 and 18 as the photoinitiator, if tetraphetyl is really meant to be tetraphenyl. With respect to instant claims 1 and 4-6, 12 and 18, the use of any of the examples of polymers given by Shimizu et al with any examples of addition polymerizable unsaturated compound and photopolymerization initiator given by Shimizu et al to form the compositions and plates taught would have been the simple substitution of one known element for another to obtain predictable results of a printing plate precursor as taught. With respect to instant claim 7, the elements of Shimizu et al is inherently

transferable in some manner thus being a transfer film. Applicants have not supplied further explicit definition to "transfer film" other than using the term. With respect to instant claim 8, the coating weight of 20 mg/dm<sup>2</sup> set forth by Shimizu et al for their layers is held to be inherently within the range of 5 to 200  $\mu$ m. With respect to instant claims 4-5, the compositions of Shimizu et al the variation of the percentages of components as found in Example 6 of Shimizu et al within the range of amounts of components set forth in col. 6, lines 36-52 of Shimizu et al would have been the combining of prior art elements in known percentages to yield predictable results with respect to the formation of photosensitive planographic printing plates desired by Shimizu et al wherein the imaged layer can be developed with a solution containing mainly an alkaline substance as set forth in col. 1, Field of the Invention in Shimizu et al. The paragraph directed to the percentages in Shimizu et al is as follows:

15 **The proportion of each component constituting the  
photosensitive composition of the invention is 10 to 80,  
preferably 20 to 60 % by weight of the polymer having  
the carboxylic acid residue or carboxylic acid anhy-  
dride residue, 90 to 20, preferably 80 to 40 % by weight  
50 of addition polymerizable unsaturated compound and  
0.1 to 20, preferably 1 to 10 % by weight of photopo-  
lymerization initiator.**

The copolymer of Example 6 of Shimizu et al is as follows:

### EXAMPLE 6 AND COMPARISON EXAMPLE 9

A photosensitive solution was prepared by repeating Example 1, but the copolymers were displaced with 50 hydroxyphenylmethacrylamide/acrylonitrile/ethyl acrylate/methacrylic acid copolymer (molar ratio of monomers in the synthesis; 8/24/60/8, molecular weight about 60,000) synthesized by the conventional method. The anodically oxidized and grained aluminum 55 plate No. 3 was coated with the photosensitive solution obtained above, and further covered with the protective layer to obtain a photopolymerizable photosensitive planographic printing plate. The planographic

and Example 1 of Shimizu et al wherein the copolymer of Example 6 is substituted is as follows:

## B. Preparation of the sensitive layer

The anodically oxidized aluminum plates Nos. 1 to 5 were coated with a photosensitive solution obtained by dissolving 9 g of styrene/maleic acid anhydride (partial semi-ester) copolymer ("Stylite CM-2L", M.W.; about 5,000, provided by Sankyo Chemical Industry Co., Ltd.) 1 g of methyl methacrylate/methacrylic acid copolymer synthesized by a conventional method (molar ratio of monomers in the synthesis; 9/1, M.W.; about 50,000) 10 g of trimethylolpropane triacrylate ("Biscoat 295" provided by Osaka Organic Chemical Industry Co., Ltd.), 0.4 g of 2-dibenzoyl-methylene-N-methyl- $\beta$ -naphtothiazoline, 0.4 g of 2,4,6-tris(trichloromethyl)-1,3,5-triazine and 0.15 g of Victoria Pure Blue BOH (Hodogaya Chemical Co. Ltd.) in 180 g of ethyl cellosolve, by means of a whirler in dry amount of 20 mg/dm<sup>2</sup>. Then the surface of each photo-sensitive layer was covered with a protective layer by applying an aqueous solution of polyvinylalcohol in dry amount of 20 mg/dm<sup>2</sup> to obtain a photosensitive planographic printing plate.

5

10

15

20

25

8. Applicant's arguments filed 31 October 2007 have been fully considered but they are not persuasive. Shimizu et al does teach one of the species of photoinitiators added to claim 1 by amendment. The new rejection above addresses such. The rejection stands.

9. Claims 1, 4-8, and 12- 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al (4,990,428)In view of Monroe et al (Chemical Reviews). With respect to instant claims 1, 4-8, 12 and 18, the composition of Example 6 of Shimizu et al teaches all of a species of the instant invention with the exception of the photoinitiator used the intended use and the

percentages of some of the components used. The copolymer of hydroxyphenylmethacrylamide are the polymers of instant formula (2) wherein n=0 and m=0 and R1=Hydrogen atom and R2 is a single bond as there are no methylene groups present because n=0. Thus, when Shimizu teaches the combining of the polymer in claim 1 with the addition polymerizable unsaturated compound and photopolymerization initiator, the polymer of Example 6 is an example of the polymer as is trimethylolpropane triacrylate found in col. 9, line 14, is an example of the addition polymerizable unsaturated compound. While example 6 makes use of triazine, and a naphtothiazoline as the photoinitiator system in Example 6, Shimizu et al teach, in col. 6, lines 34-43, the use of any conventional photopolymerization initiators in their compositions. Monroe et al, at page 440, 5. Acyl Phosphine Oxide, the known use of acyl phosphine oxides as free-radical initiated photopolymerizers especially for use in printing plates. On page 439, under "C. Aromatic Carbonyl Compounds", Monroe also discloses the well known use of ketals for free radical initiators. Benzyl dimethyl ketal is the formula (17) and is another name for 2,2dimethoxy-1,2-diphenylethan-1-one. With respect to any of these well known free radical initiators used in photoimageable media and instant claims 1 and 4-6 and 12-15, the use of such instead of the triazine, and a naphtothiazoline mixture in Example 6 would have been the substitution of one known free radical photopolymerization initiator for another yielding the expected results of a composition useful in forming printing plates. With respect to instant claim 7, the elements of Shimizu et al is inherently transferable in some manner thus being a transfer film. Applicants have not supplied further explicit definition to "transfer film" other than using the term. With respect to instant claim 8, the coating weight of 20 mg/dm<sup>2</sup> set forth by Shimizu et al for their layers is held to be inherently within the range of 5 to 200  $\mu$ m. With respect to

instant claims 4-5, the compositions of Shimizu et al the variation of the percentages of components as found in Example 6 of Shimizu et al within the range of amounts of components set forth in col. 6, lines 36-52 of Shimizu et al would have been the combining of prior art elements in known percentages to yield predictable results with respect to the formation of photosensitive planographic printing plates desired by Shimizu et al wherein the imaged layer can be developed with a solution containing mainly an alkaline substance as set forth in col. 1, Field of the Invention in Shimizu et al. The paragraph directed to the percentages in Shimizu et al is as follows:

15 The proportion of each component constituting the  
photosensitive composition of the invention is 10 to 80,  
preferably 20 to 60 % by weight of the polymer having  
the carboxylic acid residue or carboxylic acid anhy-  
dride residue, 90 to 20, preferably 80 to 40 % by weight  
50 of addition polymerizable unsaturated compound and  
0.1 to 20, preferably 1 to 10 % by weight of photopo-  
lymerization initiator.

The copolymer of Example 6 of Shimizu et al is as follows:

### EXAMPLE 6 AND COMPARISON EXAMPLE 9

A photosensitive solution was prepared by repeating Example 1, but the copolymers were displaced with 50 hydroxyphenylmethacrylamide/acrylonitrile/ethyl acrylate/methacrylic acid copolymer (molar ratio of monomers in the synthesis; 8/24/60/8, molecular weight about 60,000) synthesized by the conventional method. The anodically oxidized and grained aluminum 55 plate No. 3 was coated with the photosensitive solution obtained above, and further covered with the protective layer to obtain a photopolymerizable photosensitive planographic printing plate. The planographic

and Example 1 of Shimizu et al wherein the copolymer of Example 6 is substituted is as follows:

## B. Preparation of the sensitive layer

The anodically oxidized aluminum plates Nos. 1 to 5 were coated with a photosensitive solution obtained by dissolving 9 g of styrene/maleic acid anhydride (partial semi-ester) copolymer ("Stylite CM-2L", M.W.; about 5,000, provided by Sankyo Chemical Industry Co., Ltd.) 1 g of methyl methacrylate/methacrylic acid copolymer synthesized by a conventional method (molar ratio of monomers in the synthesis; 9/1, M.W.; about 50,000) 10 g of trimethylolpropane triacrylate ("Biscoat 295" provided by Osaka Organic Chemical Industry Co., Ltd.), 0.4 g of 2-dibenzoyl-methylene-N-methyl- $\beta$ -naphtothiazoline, 0.4 g of 2,4,6-tris(trichloromethyl)-1,3,5-triazine and 0.15 g of Victoria Pure Blue BOH (Hodogaya Chemical Co. Ltd.) in 180 g of ethyl cellosolve, by means of a whirler in dry amount of 20 mg/dm<sup>2</sup>. Then the surface of each photo-sensitive layer was covered with a protective layer by applying an aqueous solution of polyvinylalcohol in dry amount of 20 mg/dm<sup>2</sup> to obtain a photosensitive planographic printing plate.

5

10

15

20

25

10. Applicant is advised that should claim 14 be found allowable, claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k). RN 24650-42-8 is cited to show that benzyl dimethyl ketal is the same compound as 2,2-dimethoxy-

1,2,diphenylethane-1-one which is assumed to be the compound given by claim 14 minus the "I" in "dimethoxyl".

11. Claims 1, 4-8 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komano et al (6,010,824) in view of Monroe et al (Chemical Reviews) or in view of Hofmann et al (5,573,889) or Nomura et al (5,310,862) or Obiya et al (5,776,995). With respect to claims 1, 4-8 and 12-18, the photosensitive resins and elements of Komano et al disclose all of the instant compositions with the exception of the specific photoinitiators used and elements wherein the polymer used is formula (1) m=0 and R<sub>2</sub> is a single bond with the exception of an explicit example of a transfer film as set forth in instant claims 7-8 if such terminology is in reference to a dry photoresist laminate wherein the image layer is to be temporarily stored on one substrate then transferred to another before imaging with electromagnetic radiation occurs. Komono et al does teach, in col. 9, lines 5-18, the addition of other known photoinitiators to their compositions for further improving sensitivity. Examples given are benzoin derivatives and acetophenone derivatives among others. Monroe et al, at page 440, 5. Acyl Phosphine Oxide, the known use of acyl phosphine oxides as photopolymerizers as well as ketals either as benzyl derivatives or acetophenone derivatives on page 439. On page 439, under "C. Aromatic Carbonyl Compounds", Monroe also discloses the well known use of ketals for free radical initiators. Benzyl dimethyl ketal is the formula (17) and is another name for 2,2dimethoxyl-1,2-diphenylethan-1-one. Monroe et al teaches the instant free radical photopolymerization initiator as set forth in instant claim 18 as well. Hofmann et al teaches the use of the oxime inclusive of the oxime of instant claim 17 as used in mixtures of free radical generating photoinitiators for curing in the UV/VI laser range. In Hofmann et al, see particularly col. 5, lines 55-64, and col.

36-38 in col. 6 and col. 5, lines 33-52, as well as col. 2-5 in referencing mixing photoinitiators to maximize curing depth and breadth of wavelength exposure. As to the known use of benzyl – beta- methoxyethyl acetal for photoinitiating free radical systems, Nomura et al in col. 9, lines 40-51, teach this as do Obiya et al in col. 4, lines 41-61. With respect to instant claims 1, 4-8 and 12-18, the addition of any known photoinitiator into the compositions of Komono et al in order to aid in the photosensitivity of the compositions would have been the combining of prior art photoinitiators according to known methods to yield predictable results of photoimaging the layers of Komono et al. With respect to instant claims Komono et al does disclose examples of the compositions in their examples for PS plates in Examples I-IV and 2-1 in col. 25 wherein polymers comprised of hydroxyphenylmethacrylate are disclosed. Further, the use of the compositions of Komono et al are taught to be useful for printed circuit formation in the FIELD OF THE INVENTION and SUMMARY OF THE INVENTION at the top of co. 4. The polymeric binders found useful by Komono et al are set forth in the paragraph bridging col. 10-11 and are inclusive of those made from p=hydroxyphenyl (meth) acrylate and have weight average molecular weights of 10,000 to 200,000 with the preferred binders being as set forth in col. 11, lines 35-39, as follows:

Preferred combinations of monomers of the polymeric binders include a combination of methacrylic acid/methyl methacrylate/benzyl methacrylate/hydroxyphenyl methacrylate and a combination of methacrylic acid/methyl methacrylate/styrene/hydroxyphenyl methacrylate.

The compounding ration of the compositions of Komono et al is set forth in col. 12 lines 27-46 and is reproduced below:

The compounding ratio of the above-mentioned components in the photosensitive resin composition more or less varies depending on its final use (e.g., use for a PS plate, a letterpress printing plate, a printed circuit board). Preferably, the photosensitive resin composition comprises from 10 to 60 parts by weight of the polymeric binder, from 20 to 70 parts by weight of the ethylenically unsaturated monomer, and from 0.1 to 30 parts by weight of photopolymerization initiator, including from 0.1 to 15 parts by weight of the triazine compound represented by formulae (I) to (V) and other photopolymerization initiators such as a titanocene compound, an acridine compound, etc., each based on 100 parts by weight of the total solids content of the photosensitive resin composition.

The photosensitive resin composition is prepared by mixing the above-mentioned components with the aid of from 10 to 1,000 parts by weight of a known solvent, such as alkylene glycol mono(or di)alkyl ethers, ketones, alcohols and carboxylic acid esters, per 100 parts by weight of the total solids content of the photosensitive resin composition.

This composition is stated by Komono et al as useful in lines 47-54, as a photoresist, photosolder resist or plating resist and at the top of col. 13, Komono et al discloses the formation of a dry film resist on a PET, i.e. polyethylene terephthalate as known by workers of ordinary skill in the art, substrate in a dry film thickness of from 1-4 g/m<sup>2</sup>. The example of preparation in col. 24, lines 22-53 of Komono et al is drawn to preparation of Printed Circuit Board and the dry thickness of the layer is 50 µm. Thus, with respect to instant claims 1, 4-8 and 12-18, Komono et al teach the formation of transferable photoresists for the formation of printed circuits with thicknesses within the range sought by applicants to form etch resists, plating resists and solder

resists thus combining the known prior elements of dry photoresists with the known methods of circuit board formation to yield the desired results of Komono et al photosensitive resin compositions with very high sensitivity and excellent developability when using argon laser light to produce plating resists as set forth in col. 1 of Komono et al.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Komano et al (6,010,824) as applied to claim 1 above, and further in view of Danielson et al (US 6,426,176 B1). With respect to instant claim 9, Komano et al teaches the use of compositions like that of instant claim 1 as plating resists and solder resists as set forth above. Komano et al does not teach the methods of plating with such plating resists and solder resists. Danielson et al teaches a process which reads on that of instant claim 9 with the exception of the instant composition of claim 1. Claim 1 below from Danielson et al is the process which has all the instant steps but is not specific about the photoresist used:

1. A method of forming a conductive structure on an <sup>20</sup>  
integrated circuit substrate comprising:

forming a photoresist layer over the substrate;

patterning the photoresist layer to define an opening  
extending to a metal part on the substrate; <sup>25</sup>

plating a metal bump of a first material on the substrate so  
that the metal bump electrically contacts the metal part  
on the substrate, the metal bump having a stem in the  
opening in the photoresist layer and a head on the stem  
and over the photoresist layer; <sup>30</sup>

removing the photoresist layer to expose the stem; and

plating a protective layer on the metal bump, the protective  
layer forming on the head and on the exposed stem,  
the protective layer being of a second material, wherein  
the first material has a first conductivity and the second  
material has a second conductivity which is higher than  
the first conductivity. <sup>35</sup>

The method is also set forth in col. 2 of Danielson et al. wherein it is clear that a wafer can be used and that a conductive metal layer is deposited thereon before the photoresist I layer is deposited on the metal.

This invention relates to a method of forming conductive structure on an integrated circuit substrate such as a semiconductor die or wafer. For the most part the conductive structure is formed according to a process which is known as the controlled collapse chip connect (C4) process. A conductive metal layer is deposited on the substrate. A photoresist layer is then deposited on the conductive metal layer. The photoresist layer is then patterned to define openings above bond pads on the substrate. A lead containing bump is then formed within each opening. The bump fills the opening and partially overlies the photoresist layer. The bump is formed utilizing an electroplating technique. A tin protective layer is then formed on the bump. The photoresist layer may be removed before or after forming the tin protective layer. In the case where the photoresist layer is removed after the tin protective layer is formed, the conductive metal layer may then be partially removed to leave a metal portion below each bump. The protective layer reduces the contact resistance between the bump and a probe card which is brought into contact with the conductive structure.

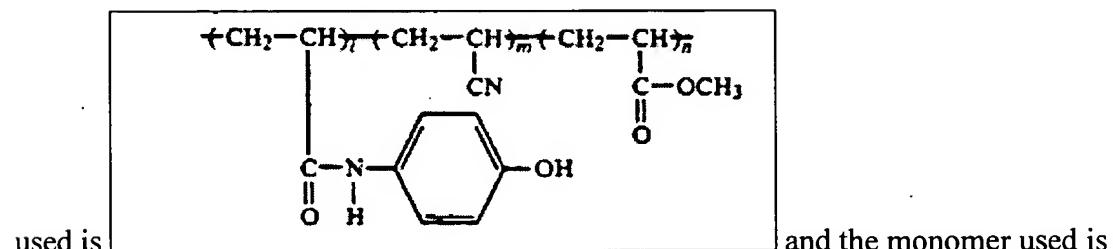
The bump is electroplated down after patterning then stripped ant the conductive layer on the wafer partially removed. Etching is the method set forth in col. 4, lines 4-14. Thus, Danielson et al teaches all but the specific photoresist set forth in instant claim 9. With respect to instant claim 9, the use of known plating photoresists such as that taught by Komano et al in the plating processes of Danielson et al would have been the combining prior art elements according to known methods to yield predictable results.

13. Claims 1 and 4-6 and 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konica Corp (JP 08-179505 A) as evidenced by the Patent Abstracts of Japan given by applicants with the Japanese document as a cover sheet and the English translation generated by machine at the AIPN site by the USPTO of JP 08-179505 A further in view of Monroe et al (Chemical Reviews) or in view of Hofmann et al (5,573,889) or Nomura et al (5,310,862) or Obiya et al (5,776,995). With respect to the English translation of Konica Corp, because the tabular data has not been fully translated by the machine into English, the examiner cannot determine what was actually used by Konica Corp in their explicit examples. For this reason, because a full clear translation is not available, only a rejection under 5 U.S.C. 103(a) is possible. Konica Corp teach the use of “negative type photosensitive compositions” with excellent developability which are comprised of alkali-soluble polymers made from monomers inclusive of p-hydroxyphenyl (meta) acrylamide or p-hydroxyphenyl (meta) acrylamide in the machine translation at [0033]. The “meta” is taken to reference “metha” when considering the English Abstract wherein R1 is taken as H or methyl. These polymers are also taught be combined with an addition polymerizable monomer and a photopolymerization initiator in the English Abstract of Konica Corp. In [0016] of Konica Corp the compound which has addition-polymerization nature is also taught as unsaturated and inclusive of triethylene glycol di (metha)acrylate, “trimethylol propane bird (meta) acrylate as well as others. The examiner has assumed “metha” and “meta” are the machine translations for “meth” and would assume a worker of ordinary skill in the art would assume the same. The amounts of monomer to polymer used is taught by Konica Corp in [0018] as 10-50 weight % addition polymerizable compound to total solids in the “negative type photosensitive compositions”. The photoinitiator is used in .05 to 30 weight %

total solids as set forth in [0021] in Konica Corp and the use of a coating solvent is set forth in [0062] to [0065]. The specific photoinitiators of the instant invention are not disclosed by Konica Corp. Monroe et al, at page 440, 5. Acyl Phosphine Oxide, the known use of acyl phosphine oxides as photopolymerizers as well as ketals either as benzyl derivatives or acetophenone derivatives on page 439. On page 439, under "C. Aromatic Carbonyl Compounds", Monroe also discloses the well known use of ketals for free radical initiators. Benzyl dimethyl ketal is the formula (17) and is another name for 2,2dimethoxyl-1,2-diphenylethan-1-one. Monroe et al teaches the instant free radical photopolymerization initiator as set forth in instant claim 18 as well. Hofmann et al teaches the use of the oxime inclusive of the oxime of instant claim 17 as used in mixtures of free radical generating photoinitiators for curing in the UV/VI laser range. In Hofmann et al, see particularly col. 5, lines 55-64, and col. 36-38 in col. 6 and col. 5, lines 33-52, as well as col. 2-5 in referencing mixing photoinitiators to maximize curing depth and breadth of wavelength exposure. As to the known use of benzyl - beta- methoxyethyl acetal for photo initiating free radical systems, Nomura et al in col. 9, lines 40-51, teach this as do Obiya et al in col. 4, lines 41-61. With respect to instant claims 1, 4-6 and 12-18, the addition of any known photoinitiator into the compositions of Konica Corp as photoinitiator would have been the substituting of prior art photoinitiators according to known methods to yield predictable results of photo imaging the layers of Konica Corp. IF the binder is considered to be present in sufficient amount to allow developability of the imaged layer, then it must be present in sufficient amounts to do such. With the addition polymerizable compound being present in 50 % to 10% of the solids content then the Binder would bee a significant portion of the remainder of weight percent not taken up by the photopolymerization initiator and

addition polymerizable compound which would be the remaining 20 to 80 weight % of the solids content if not considering the pigment addition and diazo compound addition set forth as optional. With respect to instant claims 1, 4-6 and 12-18, the photosensitive compositions of Konica Corp would make *prima facie* obvious the instant compositions because the use of any of the cited addition polymerizable compounds with the polymers of Konica Corp in the range of compounding given to form the negative type photosensitive compositions of Konica Corp. to obtain the expected excellent developability in an aqueous alkaline developer without the use of an organic solvent would have been predictable. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Werthheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 UAPQ2d 1934 (Fed. Cir. 1990). See particularly MPEP 2144.05.

14. Claims 1, 4 and 6-7 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasa et al (5,068,689) in view of Monroe et al (Chemical Reviews) or in view of Hofmann et al (5,573,889) or Nomura et al (5,310,862) or Obiya et al (5,776,995). With respect to instant claims 1, 4 and 6-7 and 12-18, the compositions of Experiment Example 2 of Sasa et al teach all of the instant invention with the exception of the specific photoinitiators. The polymer



**Pentaerythritol tetraacrylate** and the polymerization initiator is **Benzophenone** and the solvent is **Methyl cellosolve** and it is coated onto an ethylene-vinyl acetate

copolymer resin layer coated onto a polyethylene terephthalate film. These elements were imaged then developed and the images transferred to art paper as set forth in col. 16 of Sasa et al thus the elements made in Example 2 of Sasa et al are transfer films. Monroe et al, at page 440, 5. Acyl Phosphine Oxide, the known use of acyl phosphine oxides as photopolymerizers as well as ketals either as benzyl derivatives or acetophenone derivatives on page 439. On page 439, under "C. Aromatic Carbonyl Compounds", Monroe also discloses the well known use of ketals for free radical initiators. Benzyl dimethyl ketal is the formula (17) and is another name for 2,2dimethoxyl-1,2-diphenylethan-1-one. Monroe et al teaches the instant free radical photopolymerization initiator as set forth in instant claim 18 as well. Hofmann et al teaches the use of the oxime inclusive of the oxime of instant claim 17 as used in mixtures of free radical generating photoinitiators for curing in the UV/VI laser range. In Hofmann et al, see particularly col. 5, lines 55-64, and col. 36-38 in col. 6 and col. 5, lines 33-52, as well as col. 2-5 in referencing mixing photoinitiators to maximize curing depth and breadth of wavelength exposure. With respect to instant claims 1, 4-6 and 12-18, the substitution of any known free radical generating photoinitiator into the compositions of Sasa et al as photoinitiator in substitution for benzophenone would have been the substituting of prior art photoinitiators according to known methods to yield predictable results of photocuring the layers of Sasa et al.

15. Applicant's arguments filed 31 October 2007 have been fully considered but they are not persuasive. Applicants argue that Shimizu , Komano, Danielson et al, Konica Cor and Sas et al doe not suggest the instant radiation radical polymerization initiators now part of the claimed invention. The examiner notes that this is not tre of Shimizu et al, but agrees with the others. Because of this, new prior art has been added to address the obvious use of known radiation

radical polymerization initiators in substitution or in addition to those of Shimizu , Komano, Danielson et al, Konica Corp and Sas et al. With respect to the issue of film thickness and greater than 50  $\mu$ m, no such limitation is present in the instant claims, thus arguments to such a limit are moot. The rejections stand as modified due to the amendments made by applicants.

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Hamilton whose telephone number is 571-272-1331. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on (571) 272-0729. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



**CYNTHIA HAMILTON**  
**PRIMARY EXAMINER**

Cynthia Hamilton  
Primary Examiner  
Art Unit 1795

December 30, 2007